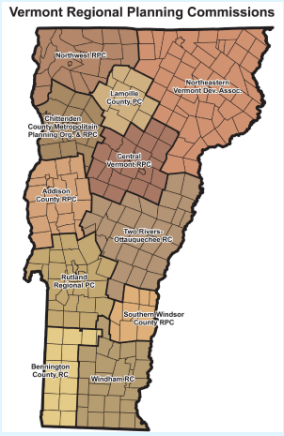
Water Quality Planning for Vermont's Future

A Report of Regional Planning Commission Activities for Vermont's FY12 604b Program

LAMOILLE COUNTY PLANNING COMMISSION
FY12 Section 604b Agreement Final Report

Executive Summary



Under the Clean Water Act Section 604b, the Lamoille County Planning Commission (LCPC) was awarded $40,000 in funding from the Vermont Department of Environmental Conservation (DEC) in Fiscal Year 12 for water quality planning projects throughout Vermont. In addition to completing its own project, LCPC managed the distribution of funds to Vermont's 10 other Regional Planning Commissions (RPCs) to carry out water quality planning projects statewide. DEC provided a framework for RPC proposals, using three water quality planning phases that would support the State's tactical river basin planning. The categories included: 1) Monitoring and Assessment, 2) Plan Development and 3) Implementation. Each category included 2-6 eligible activities. DEC required each region to coordinate its activities with the appropriate DEC Watershed Coordinator.

The collective efforts of all eleven RPCs resulted in the completion of an impressive array of projects that furthered water quality planning in Vermont. Monitoring and Assessment projects could include basin plan outreach, mapping elements, identifying candidate waters for possible Outstanding Resource Water or reclassification, soliciting municipal input on assessment needs or reviewing completed assessments, supporting a local watershed association for water quality monitoring, and spatial analysis overlay of Tropical Storm Irene damages. Five RPCs completed monitoring and assessment projects, including:

- Developing maps and outreach materials and offering technical assistance to a watershed group;
- Analyzing culvert conditions and comparing and cross-referencing assessment data sets; and
- Mapping the impacts of Tropical Storm Irene in three regions.

Plan Development projects could include acting as the representative of municipalities during tactical plan development, cataloguing zoning protectiveness and/or progress on adoption state or federal elements, serving as a member of a plan's stakeholder group, providing input on municipal regulatory actions, assisting in mapping key intervention areas, assisting to creating a "shovel ready projects" database, and soliciting comments on draft plan contents. Four RPCs completed plan development projects, including:

- Mapping damaged infrastructure and developing an online tool to track damage histories;
- Modeling storm water runoff to assist a town with planning and zoning decisions; and
- Reviewing and cataloguing water quality protection elements in municipal plans and regulations to determine the status of local progress on adoption of relevant State and FEMA elements.

Implementation projects could include working with DEC staff to provide outreach, mapping, or technical assistance to municipalities related to water quality updates in plans or zoning and supporting watershed associations or citizens during re-classification or Outstanding Resource Waters identified as candidates by the VANR-approved Tactical Basin Plan or existing Basin Plan. Three RPCs completed implementation projects, including:

- Fluvial Erosion Hazard (FEH) mapping and outreach regarding model regulations;
- Development of a comprehensive Flow Restoration Plan (FRP); and
- Assisting in the tactical basin planning process.

This report includes descriptions of the work performed, findings and results, and products delivered.

TACTICAL BASIN PLAN MONITORING & ASSESSMENT

Mapping and Outreach for the Addison County River Watch Collaborative

By the Addison County Regional Planning Commission

WORK PERFORMED

ACRPC is an active member of the Addison County River Watch Collaborative (ACRWC) and supported the organization with technical assistance and community outreach activities at the regional and municipal level. Activities were coordinated with the ACRWC Board and the DEC Watershed Coordinator. The ACRPC assisted the ACRWC with the preparation of material for outreach to municipalities and the public throughout the 2013 sampling season. New outreach maps were developed for use by the Collaborative.

TASKS UNDERTAKEN

ACRPC created and provided materials for an ACRWC presence at town meetings in March of 2013 and also assisted in the development and distribution of a press release, training flyer, various public event flyers and public correspondence. ACRPC also assisted with water quality sampling activities.

With the assistance of the ACRWC Coordinator, ACRPC developed maps for water quality outreach by the ACRWC. Water resources map data was compiled and maps were created for all 21 member municipalities depicting water quality sampling sites, geomorphic reaches, biomonitoring sites, impaired reaches, main stem river reaches, wetlands, floodplains, erosion hazard corridors where available and water source protection areas. In addition, municipal zoning districts were displayed on the maps.

The maps have been uploaded to the ACRPC website into the water resource studies section where they are available for download. In addition, the Coordinator has been trained to edit the ACRWC page and we are working on enhancing the water quality information on the web.

FINDINGS & RESULTS

The outreach efforts at town meeting resulted in 5 towns supporting and allocating funds to the ACRWC, which was 2 more than the previous year. The varied outreach efforts throughout the sampling season by the new Coordinator kept public focus on the work of the Collaborative. This resulted in good volunteer attendance at trainings and events. Sampling results have not all been quality controlled yet, but preliminary values are consistent with previous years. The VT DEC is very supportive of the work of the ACRWC and the results are used by State programs and forwarded to the EPA. As towns recognize the efforts of the ACRWC, municipal actions can strengthen support for clean water. The new maps have helped the Coordinator to familiarize himself with all the watersheds that are sampled and the zoning overlay identifies the applicable municipal policies. With a focus on individual communities the new maps will be an asset for the next round of municipal meetings.

PRODUCTS COMPLETED

- Press Release – PRESS RELEASE ACRWC Feb 2013.pdf
- Activity summary - One-page ACRWC Summary w pics
- Sample site doc - ACRWC_2013_SS.pdf
- Training Flyer - Training Flyer spring 2013.pdf
- Event invite - Valentine invite to Bobcat.pdf
- Brochure - ACRWC brochure April 2013.pdf
- ACRPC region water resource maps for 21 municipalities

Water Quality Mapping and Culvert Assessment

By the Rutland Regional Planning Commission

WORK PERFORMED

RRPC assisted with mapping and assembling data relating to various water features within basins 2 and 4 in the Rutland Region. It reviewed the condition of culverts as ranked in two separate assessments/datasets. Selected culverts ranked in SGA culvert assessments as the highest candidates for replacement and cross referenced the selected culverts with those ranked in VOBCIT assessments as poor or worse. RRPC presented findings at a public Road Commissioners meeting and followed up with towns interested in updating those culverts.

TASKS UNDERTAKEN

RRPC staff collected the most current data for each basin, including Vermont Significant Wetland Inventory, National Wetlands Inventory, hydric soils, private well locations, power generating dams, other dams, landfills, waste water treatment facilities, sub watersheds, FEMA flood zones, fluvial erosion hazard zones, geomorphic assessments, source protection areas, known water treatment discharges, surface waters determined to be "stressed", surface waters determined to be very high quality, and culvert assessment data (local, VANR, VTrans and The Nature Conservancy). This information was mapped at the basin and town level. RRPC reviewed the culverts in each basin. Selected culverts ranked in SGA culvert assessments as the highest candidates for replacement were cross referenced with those ranked in VOBCIT assessments as poor or worse.

RRPC staff downloaded culvert data for the two basins from the VANR Stream Geomorphic Assessment Data Management System. Specifically, the "Structure Failure Modes" report was downloaded. This report included information relating to existing and potential failures for each culvert. Six potential failures and seven existing failure conditions were considered. Culverts were coded based on the presence (1) or absence (0) of each existing and potential failure mode. The total of existing and potential problems was calculated for each culvert, with a maximum value of 13. Culverts were deemed "Bad" if they totaled 9 or more. VOBCIT culvert data was reviewed, and selected culverts were coded as being "Bad, Poor, Critical and Unknown." These selected culverts were cross referenced with those flagged as "Bad" in the previous step.

FINDINGS/RESULTS:

Six culverts were ranked "Bad" in both data sets: 3 culverts in West Haven, 1 culvert in Benson, Danby and Middletown Springs. RRPC staff is discussing these culverts with towns and working with VANR to help these towns find ways to best fix these issues. RRPC is also working to help the towns with unreliable data.

This study resulted in the Town of Fair Haven receiving a Better Back Roads grant to update its culvert data. This information can then be used to help support grant options in the future.

Issues with underlying data were revealed including:

- Some data was ten years old and much of the data was prior to Tropical Storm Irene.
- Points created from GPS coordinates vary depending on the accuracy of the GPS used to collect the data. Culvert points could be close to one another and actually reference the same culvert; culverts could also be close to one another and actually reference different culverts.
- The Towns of Castleton, Fair Haven and Pawlet did not have reliable culvert data available, and the Town of Proctor had very little area in the watershed and no roads.
- Another consideration regarding culverts is how the various agencies assess them. Although they do collect much of the same information, when local road crews assess culverts their main concerns are the actual condition of the pipe, the header, the wing walls and whether the inlet or outlet is blocked. When the VANR assesses culverts, its concerns relate more to the conditions of the stream as it approaches the culvert as well as the culvert. For example VANR might look at whether or not there is beaver activity nearby, deposition upstream or if the culvert is perched and not allowing fish passage. The benefit of this combined information is a very complete assessment of each culvert.
- The mapping and data collection from this project benefits the Watershed Group and the RRPC and

goes a long way in tying basin plans in with regional and town plans.
- This project was well received at the local road foreman's meeting and many towns look forward to working with RRPC in the future to update this information and possibly replace some "Bad" culverts.

PRODUCTS COMPLETED:
- Culvert assessment map for each town (16)
- Water features map for each town (16)

Tropical Storm Irene Damage Mapping

By the Southern Windsor County Regional Planning Commission

WORK PERFORMED

The SWCRPC mapped those areas within the SWCRPC Region which were heavily impacted by the effects of Tropical Storm Irene. Areas of deposition and erosion, as well as areas where streams and rivers were significantly different from the Vermont Hydrographic Data (VHD) were identified in the Bing World Imagery dataset and then outlined in a GIS shapefile. Locations were identified where the exact nature of the issue was unclear were marked as 'unknown issue' and may include deposition, erosion, landslides, or active gravel extraction. The data developed was not verified in the field or with anecdotal information from town officials.

TASKS UNDERTAKEN

SWCRPC mapped debris locations and other sites where noticeable erosion and or deposition occurred following Tropical Storm Irene. SWRPC staff created maps for Cavendish, Ludlow, Wethersfield, and Reading, and has been contacting Conservation Commissions and other volunteer organizations active in environmental conservation to discuss the project and results.

FINDINGS/RESULTS

Prior to undertaking this project, it was well established that Tropical Storm Irene caused significant damage throughout the SWCRPC region; however, the process of identifying and mapping the damage created a comprehensive understanding of the water passage. By comparing the flood damage seen during Tropical Storm Irene with both the FEMA identified flood hazard area and VANR fluvial erosion hazard zones, both the SWCRPC and member towns are better able to understand the need for river corridor protection.

PRODUCTS COMPLETED
- Damage Assessment Maps for Cavendish, Ludlow, Reading, and Weathersfield
- Regional Damage Assessment Map
- Data/Shapefiles
- River Debris data from VANR Post Tropical Storm Irene mapping project
- Tropical Storm Irene Road Damage
- Post Tropical Storm Irene River Events (SWCRPC developed)

Spatial Overlay of Tropical Storm Irene Damages with Geomorphic/Fluvial Erosion Hazard Assessment

By the Two Rivers Ottauquechee Regional Planning Commission

WORK PERFORMED

Spatial, tabular and pictorial data from USGS, National Weather Service, METSTAT, VTrans, VANR, TRORC was compiled, integrated, and mapped. No new data was created with this project.

TASKS UNDERTAKEN
TRORC staff completed an inundation mapping assessment and mapped alluvial fan impacts. Survey damage data from VTrans, VANR, and other organizations was integrated. Fluvial Erosion Hazard areas were mapped for comparison and regional and village mapping was completed.

FINDINGS/RESULTS
TRORC staff developed a greater understanding of the nature of Tropical Storm (TS) Irene in terms of the weather system, its recurrence, the resulting damage, and flood risk data and display. TRORC plans on passing this information along to its member communities through currently active FEMA mitigation grants as well as the ongoing watershed planning process with VANR.

PRODUCTS COMPLETED

- Press release
- Regional Damage Assessment Map
- Village Damage Map/Poster (3)
- Past-Future FEH/Flood Risk Comparison
- Digital geodatabase
- Summary report

The Regional Damage Assessment Map/Poster shows the extent of the TS Irene and other flood damage using the VTrans town damage database and the VANR riparian assessment database. It shows locations of previous flood events in the TRORC region as well as pictures from these events and TS Irene.

The Past/Future Flood Risk Comparison Poster discusses the path and rainfall of TS Irene as well as how it could have been worse and will happen again. It also outlines the increase in flood related disasters and the TS Irene buyout sites. It also shows the extent of the FEMA inundation mapping and the Vermont river corridor mapping and compares the two layers based on risk.

The geodatabase contains statewide buyout data sites related to the HUD-CDBG and the FEMA-HMGP programs currently underway as well USGS high water mark data, silt deposition extents and village hazards and mitigation projects for Pittsfield, Plymouth and Rochester.

The village assessment maps included flood and river corridor data as well as high water marks. These include past and current hazards as well future mitigation projects and buyout sites.

Mapping Tropical Storm Damage in the Windham Region

By the Windham Regional Commission

WORK PERFORMED
At the regional level, WRC created: 1) an inventory and map of homes and businesses that were destroyed or damaged to the point that they are no longer habitable, and 2) an inventory and map of bridges and major culverts that were destroyed and/or damaged to the point of being closed for a week or more. For the Whetstone Brook, Rock River, and Marlboro Branch, WRC created an inventory and series of maps documenting the locations of significant stream course changes, flood chutes, landslides, and bank erosion, as well as destroyed homes, and damaged and destroyed bridges and culverts.

TASKS UNDERTAKEN
The bridge damage map was created by using information from Windham Regional Commission efforts immediately following Irene to document those bridges and major culverts that were closed to traffic. Other information was used to finalize the data, including town damage surveys during October, discussions with town staff in conjunction with a VANR inventory effort, and follow-up with towns as a part of this project.

The building damage map was created from data collected by Windham Regional Commission from information provided by town officials.

The Whetstone Brook map was created by using data from Brian Bannon of Brattleboro's Planning Services Department, from Gary King of Brattleboro's Public Works Department, from town employee interviews and WRC field visits.

The Rock River and Marlboro Branch map was created from data from the Town of Newfane, Town of Marlboro, and WRC.

FINDINGS/RESULTS
WRC determined that 34 bridges and seven major culverts in the region were damaged or destroyed; 55 buildings in the region were damaged or destroyed including 25 houses, 21 mobile homes, six businesses, and one each town garage, storage, building, and old mill. 175 buildings in Brattleboro were affected by flooding: 90 buildings experienced minor damage, 67 experienced major damage (21 of these had major structural damage), and 18 were a total loss (all but one were mobile homes). Seven buildings were a total loss in the Town of Newfane.

PRODUCTS COMPLETED
Shapefiles were created for:

- bridges_major-damage.shp
- buildings _affected_polygons.shp
- Whetstone Brook & Rock River damage_line.shp and damage_point.shp
- Whetstone Brook info_point.shp, info_polygon.shp, and water_movement.shp
- Rock River & Marlboro Branch buildings _affected_points.shp, damage_line.shp, damage_point.shp, and flood_flow.shp

The following maps were created:

- Regional bridge & culvert damage, 8.5x11, breaking down the data by bridge vs. culvert, and damage, vs. destroyed. Covered bridges are noted. A chart gives information on the structure location.
- Regional buildings destroyed, 8.5x11, showing the location of the buildings, with call-out boxes noting the type of building. A chart gives information on the building town and address.
- Whetstone Brook, a two feet by three feet very large scale (1:5000) map showing flood impacts from the mouth of the Whetstone Brook to Cooke Road in Brattleboro.
- Rock River and Marlboro Branch, a two feet by three feet large scale (1:12000) map flood impacts along sections of the Rock River and Marlboro Branch.

TACTICAL BASIN PLAN DEVELOPMENT

Mapping of Damaged Infrastructure for Worcester and Plainfield

By the Central Vermont Regional Planning Commission

WORK PERFORMED
CVRPC worked with Worcester and Plainfield to develop resources to assist in the towns' flood resiliency post-Irene. These resources included a compiled list of existing studies and resources, the mapping of damage location from storms in 2011, the development of an online tool showing the damage sites, and the matching of financial costs to repair those sites.

TASKS UNDERTAKEN
CVRPC issued a press release describing its project and the grant award. It compiled existing reports, resources,

and data for each town, and met with municipal officials and staff to review compiled reports and start the identification of sites damaged. CVRPC staff loaded all existing and newly created data onto an online mapping tool for review by town. Available financial records were matched to mapped sites. Final data, the mapping tool, and reports were provided to the municipalities and State, and CVRPC staff offer to present and explain the results.

FINDINGS/RESULTS
The majority of the data compiled were sites submitted to FEMA on Town Project Worksheets. This fact made the linking of the repair cost to the mapped site very easy through the use of a unique ID, typically the project worksheet number that FEMA provided. For sites without project worksheet numbers, CVRPC staff created a unique ID for the site. Once the data was linked, the GIS shapefile was uploaded to ArcGIS Online, a free and easy to use online mapping tool.

PRODUCTS COMPLETED
Reports, photos, and GIS shapefiles showing the damage locations were created for each town. The online mapping tools can be accessed at :

- Worcester - http://bit.ly/181e1Sm;
- Plainfield - http://bit.ly/1aZltBo; or
- on CVRPC website under GIS Mapping - http://centralvtplanning.org/programs/gis-mapping/.

Water Quality Protection in the Passumpsic & Upper Connecticut Watersheds

By the Northeastern Vermont Development Association

WORK PERFORMED
NVDA reviewed and catalogue water quality protection elements in the municipal plans, zoning bylaws and subdivision regulations of all its towns, and compared those documents with the State's publication, *Local Planning and Zoning Options for Water Quality Protection*. NVDA identified and catalogued the status of local progress on adoption of relevant FEMA elements (e.g. flood resiliency, Fluvial Erosion Hazard mapping/zoning, road and bridge standards, Emergency Relief and Assistance Fund pre-requisite compliance).

TASKS UNDERTAKEN
NVDA staff collected municipal plans, bylaws, and other regulatory documents for review and catalogued the status of local progress on adoption of relevant FEMA elements. Efforts were coordinated with VANR Watershed Planners. NVDA staff drafted an inventory/assessment of water quality protection efforts for all its towns.

FINDINGS/RESULTS
NVDA began the project by focusing its work on the *Passumpsic* and *Upper Connecticut* River watersheds and were later able to review and collect information for the entire Northeast Kingdom. NVDA staff met with the VANR Watershed Planner and Natural Resource Conservation Development to discuss collective efforts in watershed planning in the Passumpsic Basin. In general, the review and assessment revealed that communities could do a much better job at protecting/maintaining water quality through municipal plan recommendations and zoning implementation than is happening at present. NVDA now has an opportunity as it works with its local communities to strengthen water quality protection language and measures.

PRODUCTS COMPLETED
NVDA produced a spreadsheet outlining water quality protection language contained in local Town Plans. The spreadsheet also identifies the status/presence of local zoning, shoreland districts, setback distances, vegetative buffer requirements, and whether flood hazard regulations exist. A technical paper developed by the VLCT Municipal Assistance Center for local communities interested in shoreland protection around lakes and ponds was distributed to municipalities along with the spreadsheet.

TACTICAL BASIN PLAN IMPLEMENTATION

Fluvial Erosion Hazards (FEH) Outreach

By the Bennington County Regional Commission

WORK PERFORMED

BCRC staff conducted outreach meetings with municipal planning commissions. BCRC hosted one regional FEH/Act 138 workshop and provided model FEH ordinances and maps to municipalities.

TASKS UNDERTAKEN

BCRC mapped FEH zones, scheduled, warned and conducted outreach meetings with local planning commissions, and scheduled, publicized and hosted a regional FEH/Act 138 workshop for municipalities, partners and the general public.

FINDINGS/RESULTS

Seven municipalities adopted FEH regulations and two municipalities have draft FEH regulations.

PRODUCTS COMPLETED

- FEH maps provided to 10 municipalities
- Outreach meetings with seven municipalities

Centennial Brook Flow Restoration Plan

By the Chittenden County Regional Planning Commission

WORK PERFORMED

CCRPC served as project manager and fiscal agent with the four MS4s of the City of Burlington, the City of South Burlington, UVM Campus Transit Management Association and the Vermont Agency of Transportation and their consultant(s) to solicit, retain and manage a qualified consultant to develop a Flow Restoration Plan (FRP) for the Centennial Brook watershed that will look at BMPs including green infrastructure. CCRPC staff worked with Karen Bates, VANR Basin #5 Coordinator, to work with VANR staff reviewing the Flow Restoration Plan (FRP) for the Centennial Brook watershed to determine the amount of flow reduction credit that selected green infrastructure strategies will earn in the FRP approved by VANR.

TASKS UNDERTAKEN

A press release describing the grant award and the project was distributed. In coordination with Karen Bates, CCRPC worked with a consultant, Horsley Witten Group of Sandwich, MA, to develop the Centennial Brook Flow Restoration Plan. The Plan incorporated green infrastructure strategies, such as bioretention; infiltration basins; underground recharge chambers and vegetated swales / rain gardens, as recommended by Karen Bates.

FINDINGS/RESULTS

The CCRPC found that the pooling of funding sources, with the CCRPC acting as a lead agency on behalf of the four MS4s, was an efficient mechanism to enable the MS4s to focus on the FRP development without having to worry about project administration. The CCRPC also found that these 604b funds aided in helping CCRPC staff to make certain Green Infrastructure Strategies were addressed by the consultant.

Horsley Witten Group:

- Used VTBMPDSS and HydroCAD models to evaluate potential stormwater retrofit implementation scenarios to meet 63% high flow reduction target of the TMDL; potential retrofits based on field investigations to identify feasible project opportunities;
- Found that the highest percent reduction achieved in model was 58%, which included >30 BMPs

managing over 90% of the watershed impervious cover;

- Found that the most effective BMPs for achieving flow reduction in this watershed are the large detention basins, which manage a significant amount of impervious cover. Retrofitting of existing storage practices cost less per impervious acre treated than constructing new retrofits; and
- Found that small-scale Green Infrastructure and large underground recharge chambers were less effective at reducing high flows at the watershed outlet primarily because of the relatively small amount of impervious cover managed per retrofit. These practices will be more important for achieving low flow improvement, which is not currently required for Centennial Brook.

PRODUCTS COMPLETED

Several project memos and reports were developed by the consultant. The original contract noted that the FRP development process was quite new and therefore approval may occur after June 2013. That fact has held true. A planned Final Draft was submitted in November 2013.

The following products were completed:

- Centennial Brook Watershed Flow Restoration Plan Development: Phase I Findings (2/4/13)
- Centennial Brook Watershed: Candidate Retrofit Site Selection (4/17/2013)
- Centennial Brook Watershed: Retrofit Field Findings Summary (10/14/2013)
- DRAFT Centennial Brook Watershed: Modeling Analysis & BMP Supporting Information (10/14/13)

Quantifying Stormwater Runoff from Development in the Lake Elmore Region

By the Lamoille County Planning Commission

WORK PERFORMED

LCPC conducted an analysis of the impact of current and future development around the Lake Elmore shoreline using a stormwater model, impervious surface data, GIS build-out analysis data and average rainfall amounts. This analysis measured the volume of stormwater runoff given current lakeshore development, and measured the potential volume of stormwater runoff in the future, given alternative scenarios. The scenarios examined included: 1) future development under current zoning regulations without low-impact development (LID) strategies, 2) future development under current zoning regulations that incorporates LID techniques, and 3) future development under alternate zoning regulations, such as increasing the current maximum lot coverage. The study provided scientifically sound information to assist the Town in future planning decisions.

TASKS UNDERTAKEN

LCPC staff met with the Elmore Selectboard to discuss the project and solicit input on potential test scenarios. LCPC staff collected and pre-processed data, which included establishing a study area of a 1000-foot buffer around Lake Elmore; updating the digital parcel layer for parcels in the study area; updating the 2006 land cover layer; and creating an impervious surface layer consisting of roads, parking lots, sidewalks and building footprints. LCPC conducted a build-out analysis using two different zoning scenarios: 10% and 15% lot coverage in the Shoreland District, and used a stormwater model to calculate the volume of runoff from existing development, from future development under current zoning (10% lot coverage) and from future development under alternate zoning (increase lot coverage to 15%). An additional model incorporating Low Impact Development (LID) techniques was also used for all scenarios. The model results were exported as a spreadsheet and incorporated into a report as charts, maps and tables. LCPC staff presented the report and findings to the Town.

FINDINGS/RESULTS

LCPC's work determined that the amount of runoff generated by gravel and impervious surfaces is disproportionate to the acreage covered by these surfaces, and thus an increase in impervious cover will result in a disproportionally higher increase in stormwater runoff. Increasing the lot coverage of the Shoreland district from 10 to 15% could result in a 4% additional increase in the total volume of stormwater runoff as compared to future development under current allowable lot coverage.

Analysis of a broader area (2000 ft) around the lake reveals that the overall volumes of stormwater are much higher but the percentage generated by impervious surfaces drops off considerably *under current conditions*. Under current zoning regulations, coverage of impervious has the potential to more than double in the future, generating a 25% overall increase in stormwater runoff. The magnitude of the modeled increase in impervious is primarily due to the currently allowable 60% lot coverage in the Village district. The overall impact of increasing the maximum lot coverage in the Shoreland district is much reduced over a broader area than in the immediate 500 foot vicinity around Lake Elmore. The model incorporating LID techniques did not yield significantly different results, likely due to the study area's predominantly rural character. Even with maximum LID implementation, the area of impervious cover is so small relative to areas of pervious cover that the effects on stormwater generation are insignificant. This outcome was different from previous models showing that in urban areas (Montpelier, VT) LID techniques of various sizes were effective at slowing the release of stormwater into the environment. This model indicates that zoning decisions can have a significant effect on stormwater runoff.

PRODUCTS COMPLETED

- Press Release published in News and Citizen on 02/15/13.
- Project proposal (Project Summary for Elmore.doc) presented to Town Selectboard on 02/13/13.
- Final report (Quantifying Impacts of Development on Stormwater Runoff.doc.)
- Presentation (LCPC_604bFY12_Project Presentation.pdf), delivered to Town on 07/10/13.
- Results_StormwaterModel.xlsx is a spreadsheet with all the detailed results from the stormwater model output.

Missisquoi Basin Plan Implementation and Lake Champlain Basin Plan Development

By the Northwest Regional Planning Commission

WORK PERFORMED

NRPC participated in the tactical basin planning process for Missisquoi and Lake Champlain watersheds. This included conducting outreach, providing comments on basin plans and technical support.

TASKS UNDERTAKEN

Missisquoi Basin Plan Implementation

The Missisquoi Basin Plan was completed. NRPC staff reviewed Missisquoi Basin Plan implementation actions. The NRPC Transportation Advisory Committee reviewed the Missisquoi Basing Plan and commented on strategies to reduce non-point source pollution from transportation infrastructure at its December 13, 2012 meeting. NRPC staff attended the Missisquoi Basin Plan adoption hearing in Enosburg Falls on January 3, 2013. NRPC met with the Montgomery Planning Commission along with DEC River Program staff on February 12 and March 12, 2013 to discuss Fluvial Erosion Hazard and other flood protection options. NRPC produced potential Fluvial Erosion Hazard maps based on existing geomorphic assessments.

Lake Champlain Basin Plan Development

The Lake Champlain tactical basin planning process did not begin during the grant period so NRPC was not able to begin plan development activities. Instead, NRPC focused on municipal outreach to communities within the Lake Champlain Basin. NRPC advertised and participated in the Friends of Northern Lake Champlain annual meeting on October 12, 2012. The meeting focused on actions being taken to improve water quality in the Lake Champlain basin. NRPC met with the Georgia Planning Commission along with DEC River Program staff on January 22, 2013 to discuss Fluvial Erosion Hazard and other flood protection options.

FINDINGS/RESULTS

The Town of Montgomery is currently working on revising its zoning bylaws. It is anticipated that the planning commission will incorporate the flood and Fluvial Erosion Hazard data in these draft regulations. The Town of Georgia revised its existing buffer language based on Fluvial Erosion Hazard (FEH) data but did not fully inte-

grate the FEH into its regulations. The Town revised its floodplain regulations to bring them into compliance with the National Flood Insurance Program. It is anticipated that the updated bylaws will be adopted on October 7, 2013.

PRODUCTS COMPLETED

- Town of Georgia memo on flood regulations and fluvial erosion hazard (FEH) zoning
- Town of Montgomery memo on flood regulations, fluvial erosion hazard (FEH) zoning and hazard mitigation plan update and FEH map.

Assessment of Continuing Program Mechanic Changes

DEC's FY12 604b program represented a shift in practice for how the program was managed and administered. Previous to FY12, DEC contracted for water quality work with eleven RPCs and accepted priorities set by RPCs as a reflection of local readiness to address water quality. For the FY12 program, DEC staff worked across disciplines to define specific categories and eligible activities that would support State water quality planning goals. DEC also contracted with one regional planning commission, rather than issuing eleven agreements. As the RPC contract partner, LCPC accepted the bulk of DEC's administrative and management duties and issued sub-agreements to the other RPCs. Overall, the program changes resulted in positive benefits for DEC, the RPCs, and water quality planning in Vermont.

Reduced Long-Term Administrative Costs
Distributing the funds to one regional planning commission, rather than issuing eleven agreements, relieved the administrative burden of eleven agreements from DEC and streamlined its process while still allowing all RPCs to complete targeted water quality planning work in their respective regions. Because RPCs have significant experience in managing State and Federal grants, DEC had assurance that its contracting partner understood program requirements. RPCs have worked cooperatively on previous statewide projects, and a common RPC-to-RPC contracting template was available, allowing for reduced administrative start-up costs.

Shifting the administrative burden from DEC to one RPC shifted the administrative cost without reducing it. LCPC addressed this disadvantage by developing a common program application and progress and final report templates and by including language in sub-agreements altering RPC payments to a 50% advance and 50% upon acceptance of the final product. Given the limited funding available to individual RPCs (~$3,636), LCPC limited the program performance period to one year, although extensions were permitted with extenuating circumstances. Only one RPC requested an extension.

Enhanced Program Performance and Water Quality Planning Gains
Proposal development and State water quality planning was enhanced by the framework provided by DEC – supporting tactical basin planning phases with a list of eligible activities. The framework allowed RPCs the flexibility to choose regionally relevant activities while ensuring that State priorities were addressed. This insured water quality planning gains were made statewide by focusing attention on needs in all areas of the state. Continuing this approach should facilitate DEC's efforts to use the Proposal for a Clean Lake Champlain as a statewide methodology for tactical basin planning by insuring a water quality planning conversation continues statewide on an annual basis.

The modified FY12 also created knowledge gains for RPCs. In previous years, RPCs activities were completed independently, relying solely on DEC Watershed Planners to transfer knowledge statewide. LCPC shared the summary of statewide activities and progress and final reports with all RPCs and alerted RPCs when proposed activities appeared to be related. These actions built relationships among regional activities and increased knowledge of actions that might create additional benefits if duplicated statewide in future years. RPC staff worked together and with DEC staff to increase program benefit, reduce duplication of effort, and strengthen best practices related to tactical basin planning outreach and complementary planning efforts.